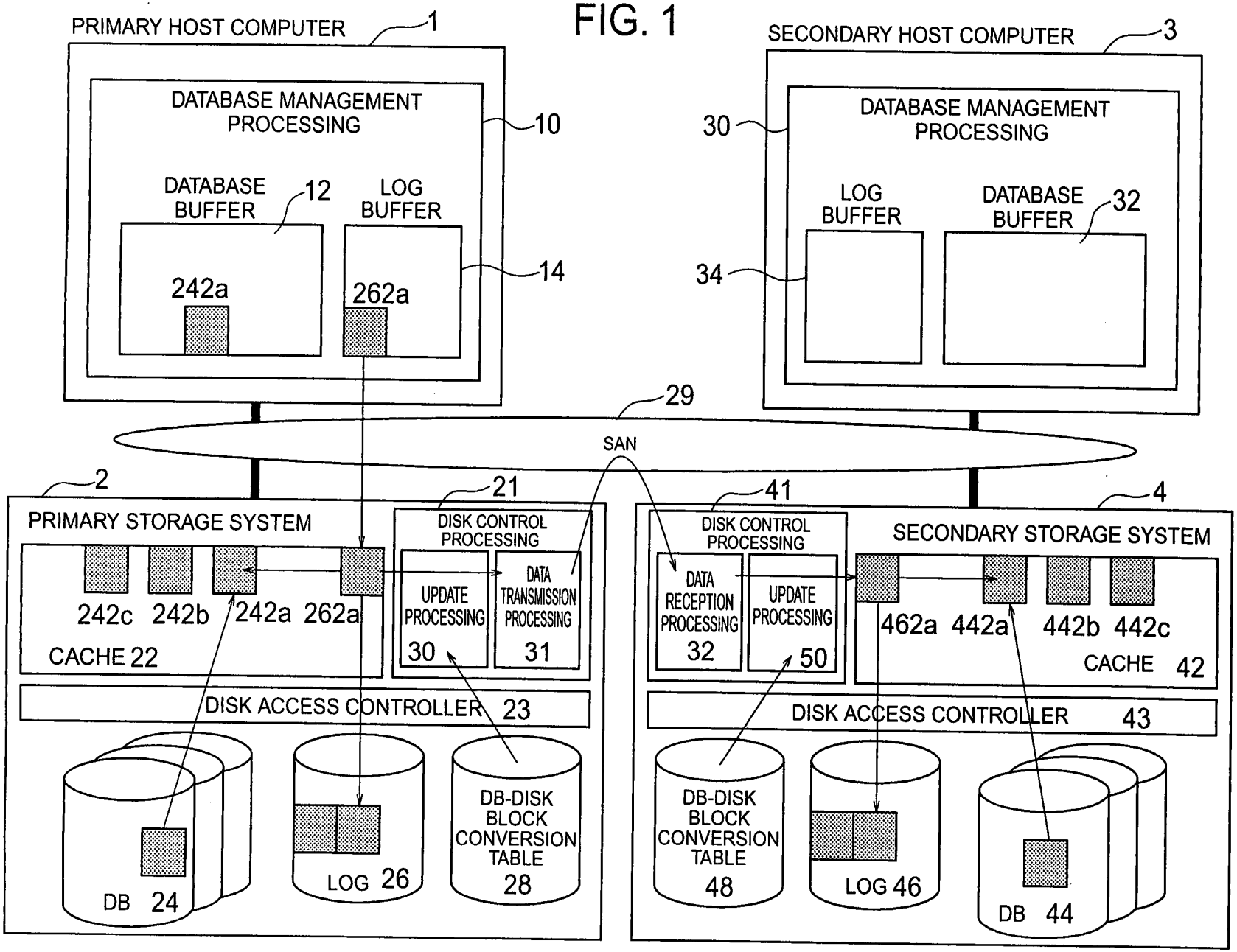
FIG. 1


PRIMARY HOST COMPUTER
1
DATABASE MANAGEMENT PROCESSING
10
DATABASE BUFFER
12
LOG BUFFER
14
242a
262a
SECONDARY HOST COMPUTER
3
30
DATABASE MANAGEMENT PROCESSING
LOG BUFFER
34
DATABASE BUFFER
32
29
SAN
2
PRIMARY STORAGE SYSTEM
21
DISK CONTROL PROCESSING
UPDATE PROCESSING
30
DATA TRANSMISSION PROCESSING
31
242c
242b
242a
262a
CACHE 22
DISK ACCESS CONTROLLER 23
DB 24
LOG 26
DB-DISK BLOCK CONVERSION TABLE
28
41
DISK CONTROL PROCESSING
DATA RECEPTION PROCESSING
32
UPDATE PROCESSING
50
4
SECONDARY STORAGE SYSTEM
462a
442a
442b
442c
CACHE 42
DISK ACCESS CONTROLLER 43
DB-DISK BLOCK CONVERSION TABLE
48
LOG 46
DB 44

W1083

FIG. 2

DB-DISK BLOCK CONVERSION TABLE

28

| DATABASE AREA ID | FILE ID | BLOCK LENGTH | LONGICAL VOLUME ID | STORAGE SYSTEM NUMBER | LOGICAL UNIT NUMBER (LUN) | LOGICAL BLOCK ADDRESS (LBA) |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

FIG. 3

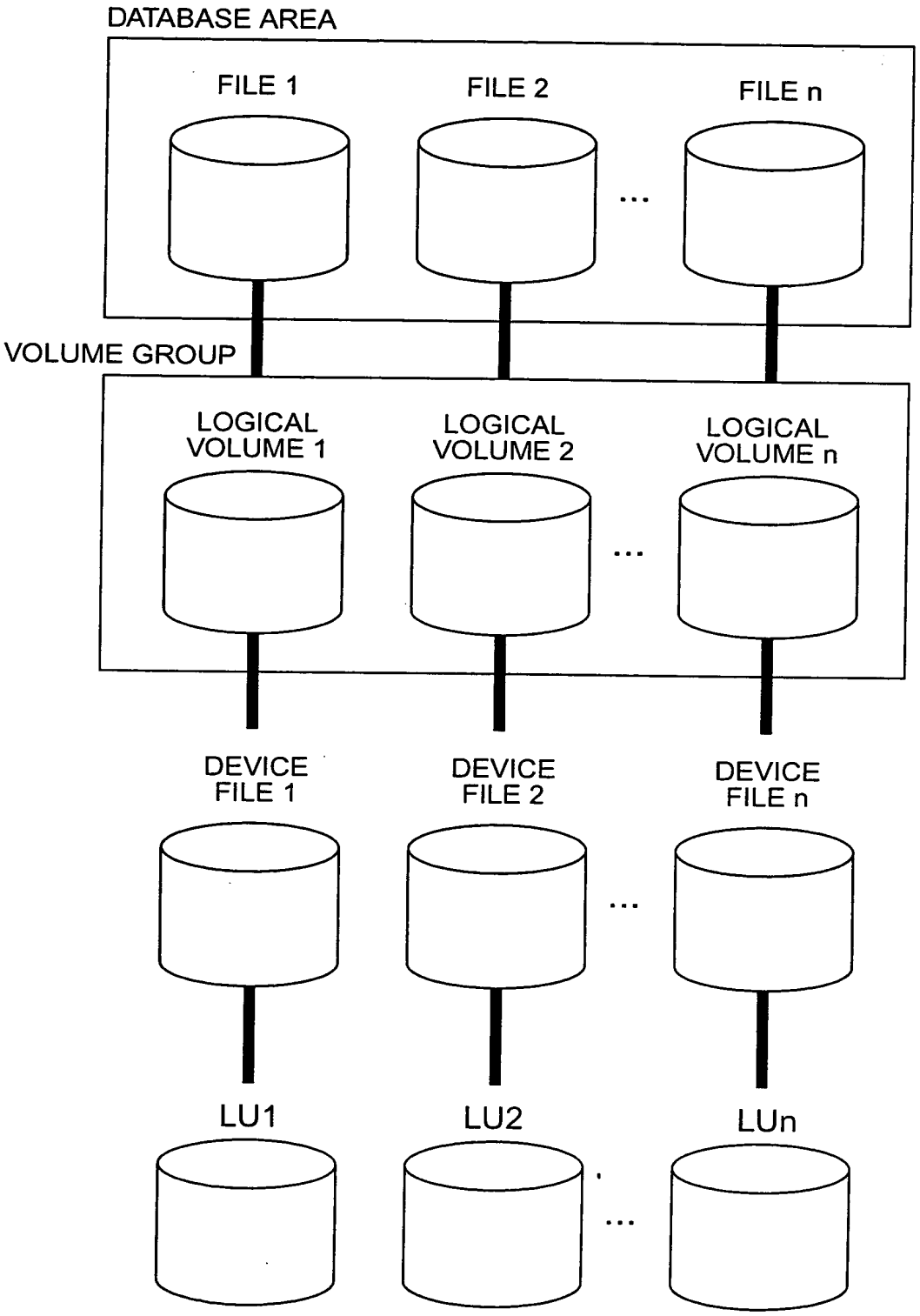

DATABASE AREA
FILE 1
FILE 2
FILE n
VOLUME GROUP
LOGICAL VOLUME 1
LOGICAL VOLUME 2
LOGICAL VOLUME n
DEVICE FILE 1
DEVICE FILE 2
DEVICE FILE n
LU1
LU2
LUn

FIG. 4

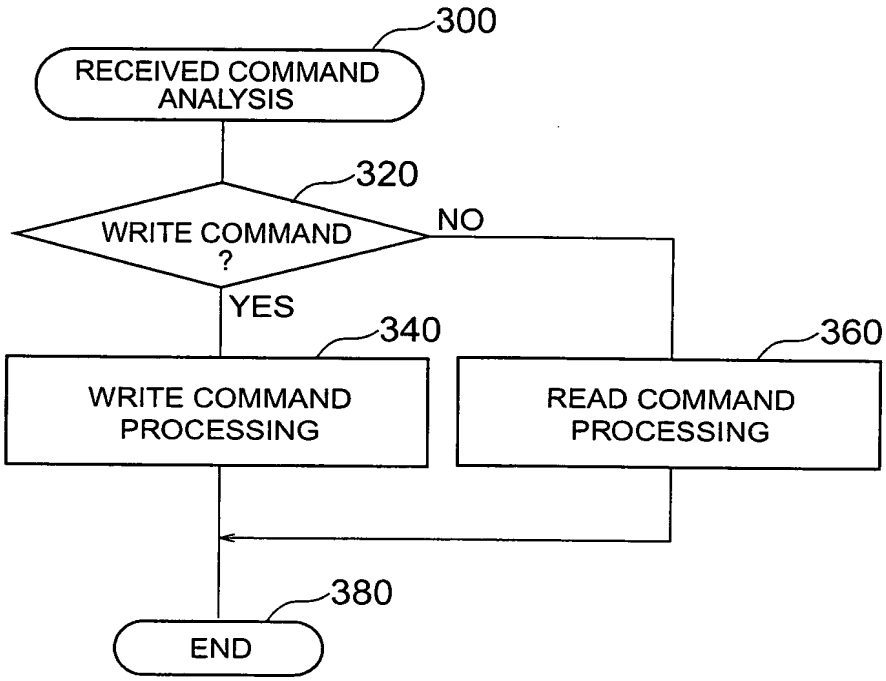

300
RECEIVED COMMAND ANALYSIS
320
WRITE COMMAND ?
NO
YES
340
WRITE COMMAND PROCESSING
360
READ COMMAND PROCESSING
380
END

FIG. 5

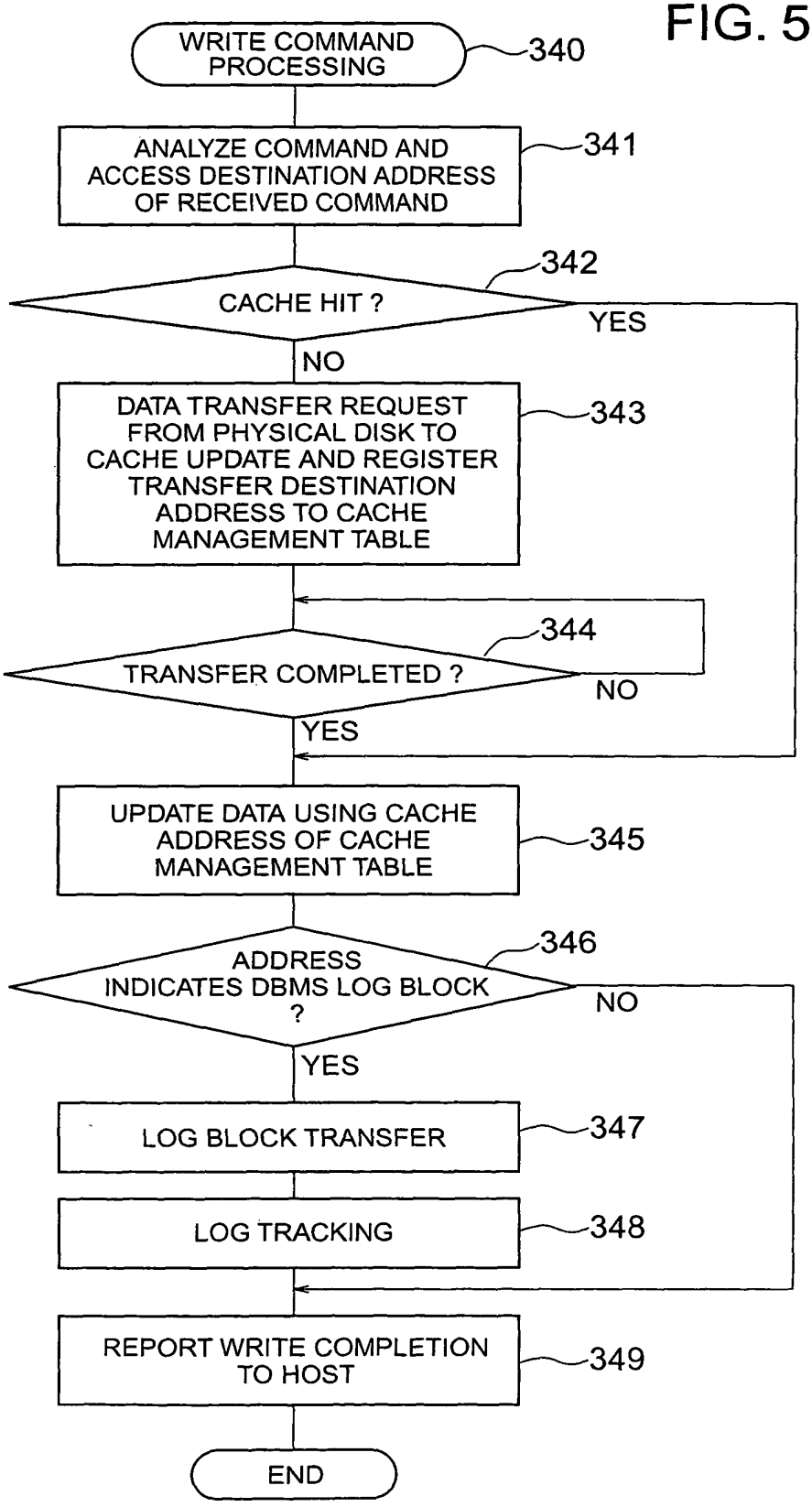

WRITE COMMAND PROCESSING
340
ANALYZE COMMAND AND ACCESS DESTINATION ADDRESS OF RECEIVED COMMAND
341
342
CACHE HIT ?
YES
NO
DATA TRANSFER REQUEST FROM PHYSICAL DISK TO CACHE UPDATE AND REGISTER TRANSFER DESTINATION ADDRESS TO CACHE MANAGEMENT TABLE
343
344
TRANSFER COMPLETED ?
NO
YES
UPDATE DATA USING CACHE ADDRESS OF CACHE MANAGEMENT TABLE
345
346
ADDRESS INDICATES DBMS LOG BLOCK ?
NO
YES
LOG BLOCK TRANSFER
347
LOG TRACKING
348
REPORT WRITE COMPLETION TO HOST
349
END

FIG. 6

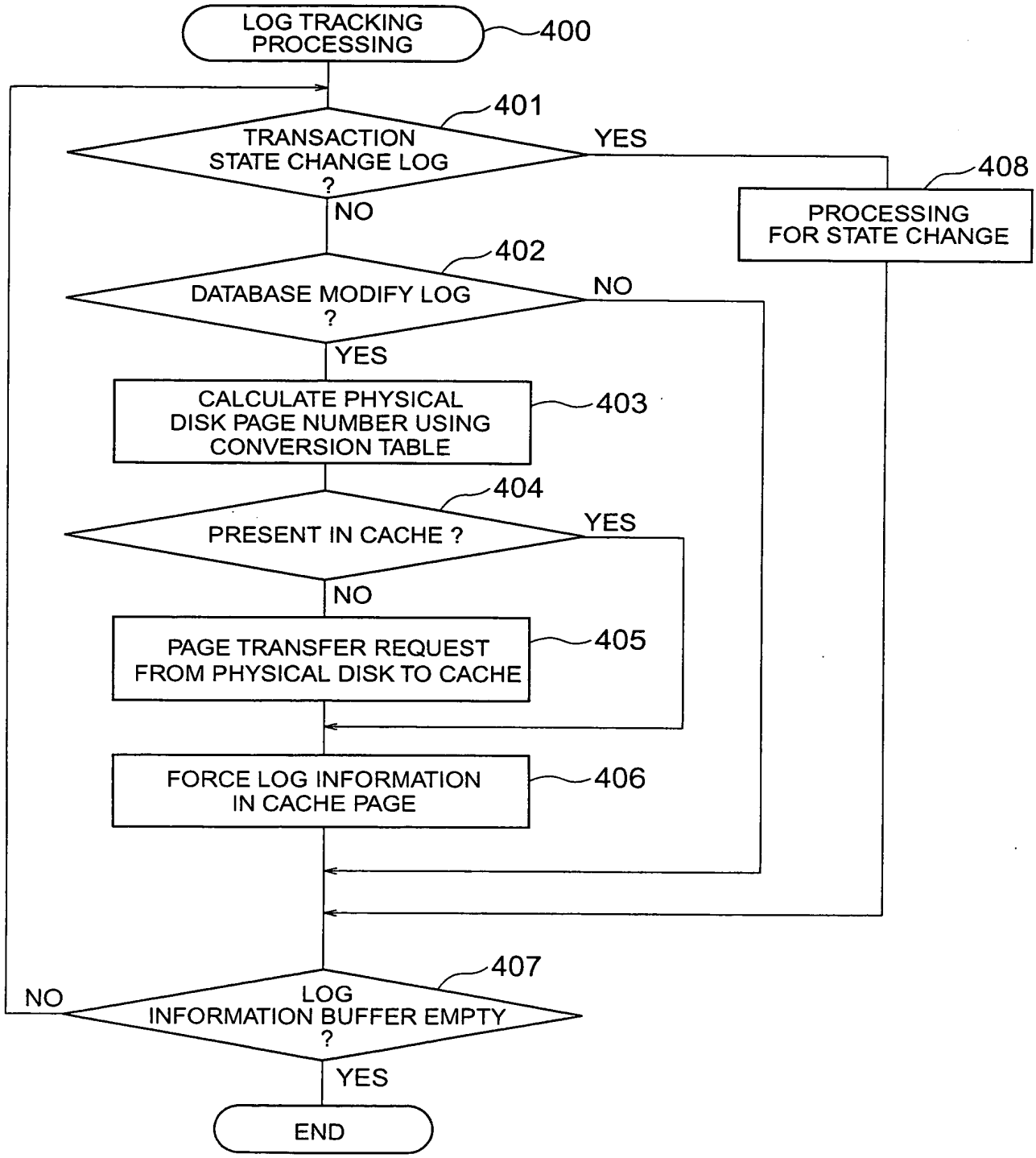

LOG TRACKING PROCESSING
400
401
TRANSACTION STATE CHANGE LOG ?
YES
NO
408
PROCESSING FOR STATE CHANGE
402
DATABASE MODIFY LOG ?
NO
YES
CALCULATE PHYSICAL DISK PAGE NUMBER USING CONVERSION TABLE
403
404
PRESENT IN CACHE ?
YES
NO
PAGE TRANSFER REQUEST FROM PHYSICAL DISK TO CACHE
405
FORCE LOG INFORMATION IN CACHE PAGE
406
407
LOG INFORMATION BUFFER EMPTY ?
NO
YES
END

FIG. 7

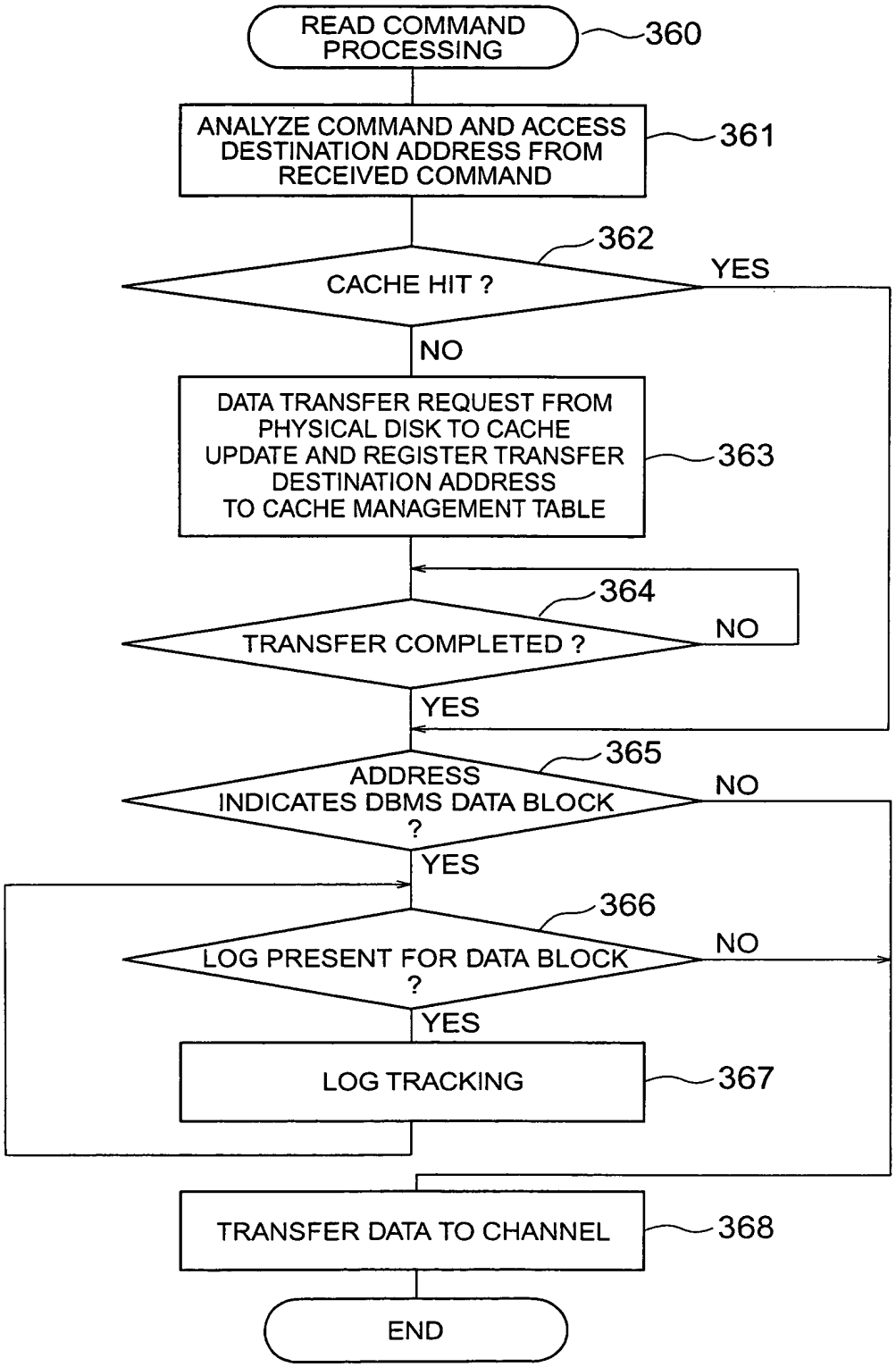

READ COMMAND PROCESSING
360
ANALYZE COMMAND AND ACCESS DESTINATION ADDRESS FROM RECEIVED COMMAND
361
362
CACHE HIT ?
YES
NO
DATA TRANSFER REQUEST FROM PHYSICAL DISK TO CACHE UPDATE AND REGISTER TRANSFER DESTINATION ADDRESS TO CACHE MANAGEMENT TABLE
363
364
TRANSFER COMPLETED ?
NO
YES
365
ADDRESS INDICATES DBMS DATA BLOCK ?
NO
YES
366
LOG PRESENT FOR DATA BLOCK ?
NO
YES
LOG TRACKING
367
TRANSFER DATA TO CHANNEL
368
END

FIG. 8

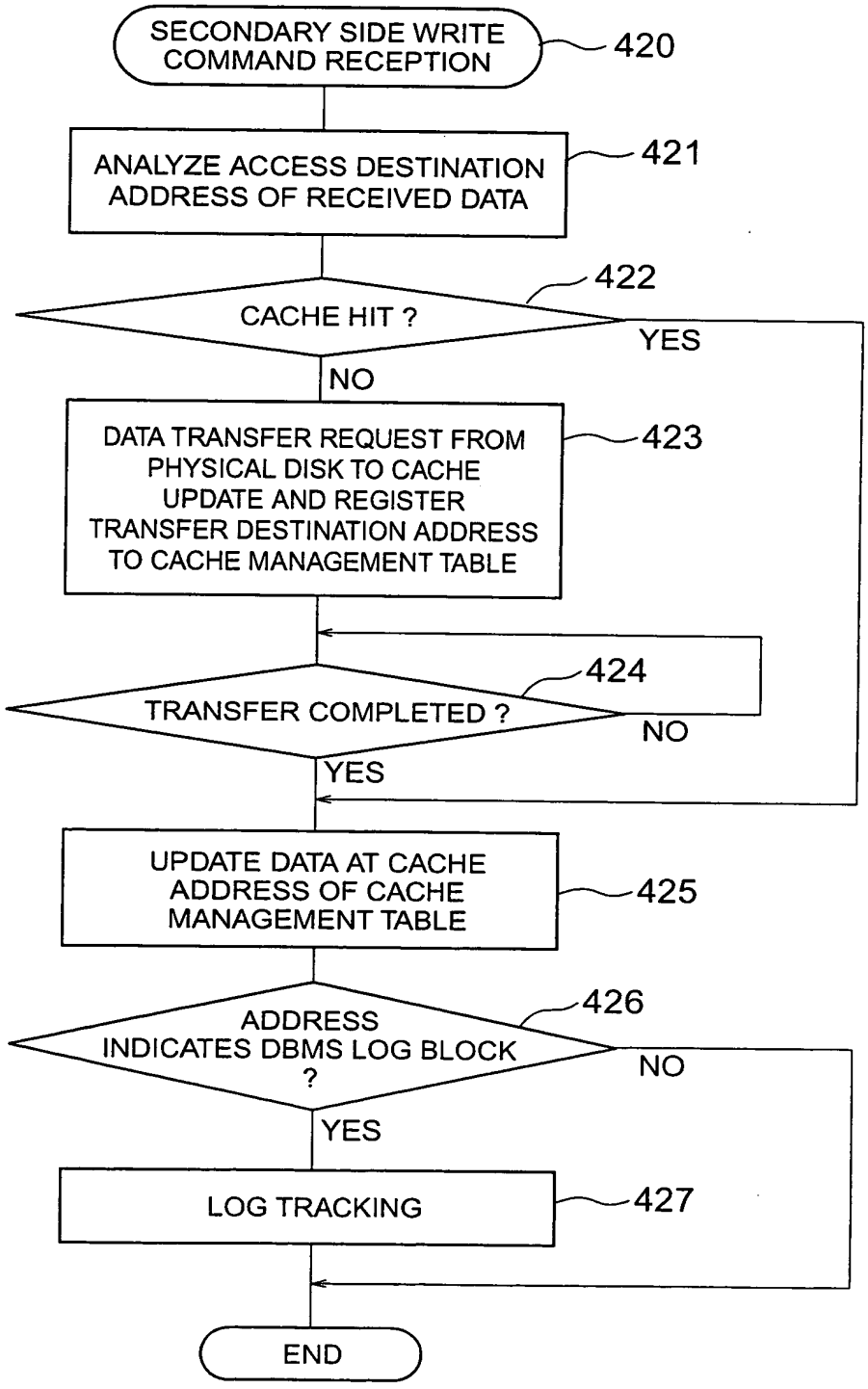

SECONDARY SIDE WRITE COMMAND RECEPTION
420
ANALYZE ACCESS DESTINATION ADDRESS OF RECEIVED DATA
421
CACHE HIT ?
422
YES
NO
DATA TRANSFER REQUEST FROM PHYSICAL DISK TO CACHE UPDATE AND REGISTER TRANSFER DESTINATION ADDRESS TO CACHE MANAGEMENT TABLE
423
TRANSFER COMPLETED ?
424
NO
YES
UPDATE DATA AT CACHE ADDRESS OF CACHE MANAGEMENT TABLE
425
ADDRESS INDICATES DBMS LOG BLOCK ?
426
NO
YES
LOG TRACKING
427
END

FIG. 9

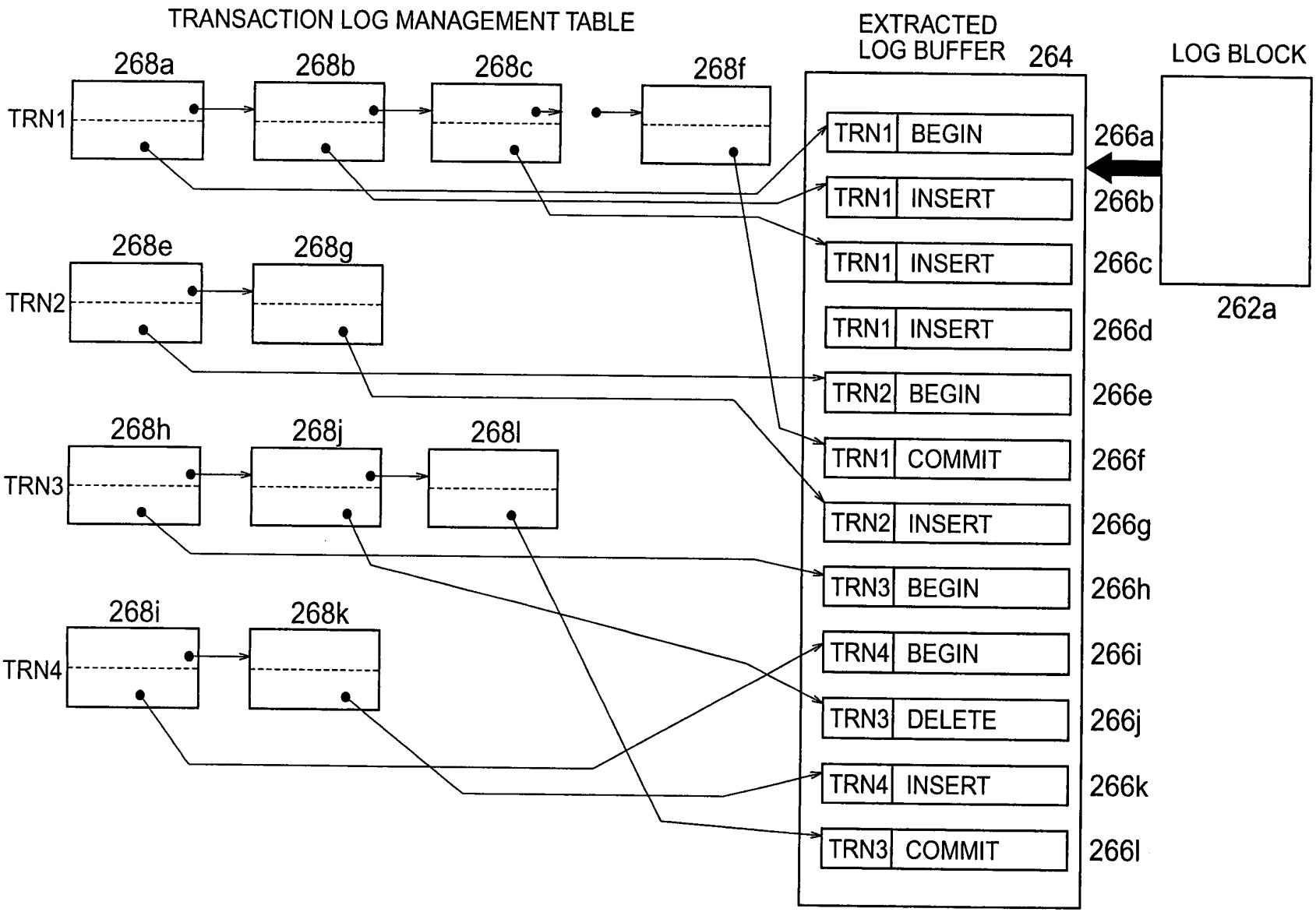

TRANSACTION LOG MANAGEMENT TABLE
EXTRACTED LOG BUFFER 264
LOG BLOCK
262a
268a
268b
268c
268f
TRN1
268e
268g
TRN2
268h
268j
268l
TRN3
268i
268k
TRN4
TRN1 BEGIN 266a
TRN1 INSERT 266b
TRN1 INSERT 266c
TRN1 INSERT 266d
TRN2 BEGIN 266e
TRN1 COMMIT 266f
TRN2 INSERT 266g
TRN3 BEGIN 266h
TRN4 BEGIN 266i
TRN3 DELETE 266j
TRN4 INSERT 266k
TRN3 COMMIT 266l

FIG. 10

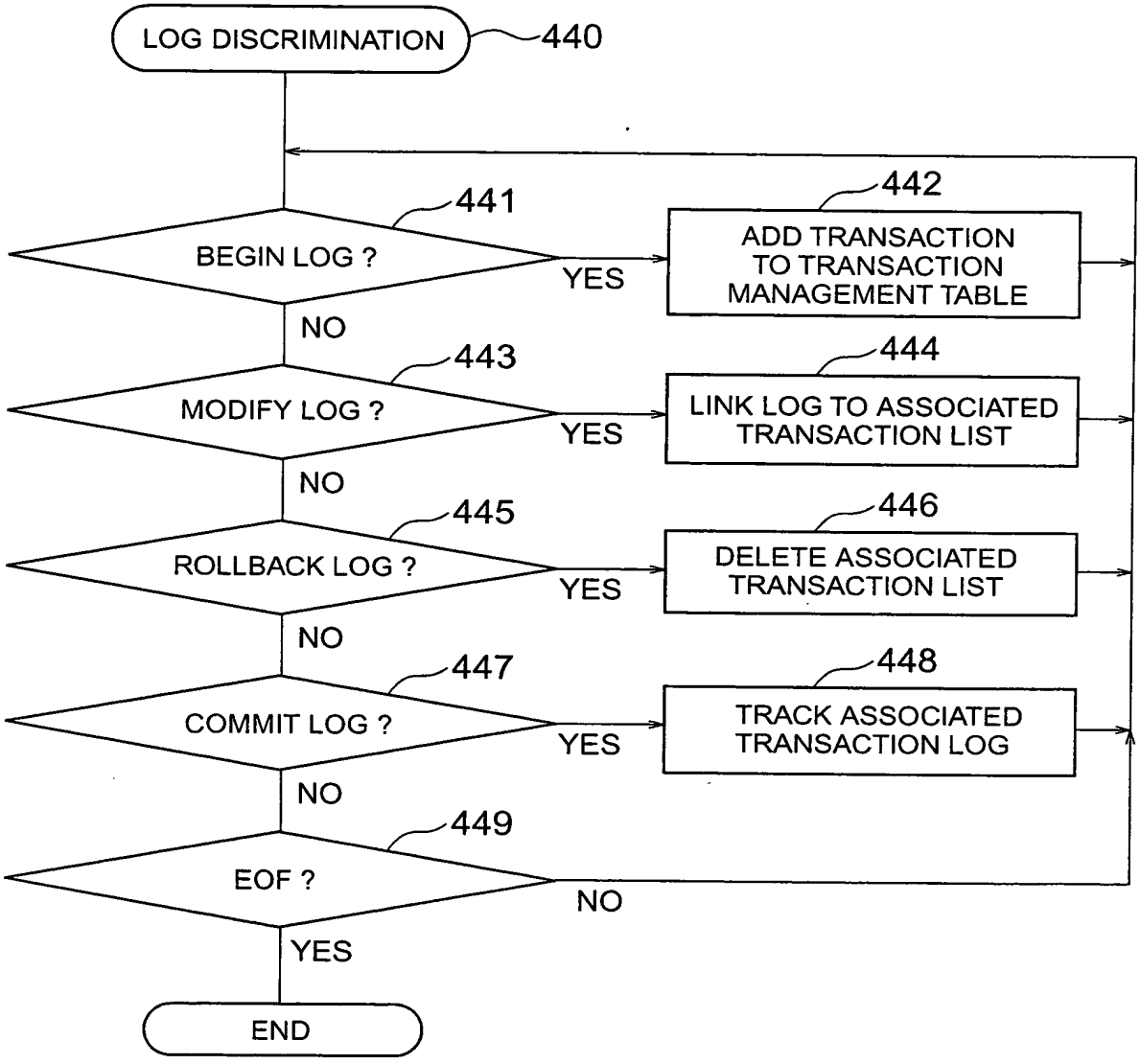

LOG DISCRIMINATION
440
441
BEGIN LOG ?
YES
442
ADD TRANSACTION TO TRANSACTION MANAGEMENT TABLE
NO
443
MODIFY LOG ?
YES
444
LINK LOG TO ASSOCIATED TRANSACTION LIST
NO
445
ROLLBACK LOG ?
YES
446
DELETE ASSOCIATED TRANSACTION LIST
NO
447
COMMIT LOG ?
YES
448
TRACK ASSOCIATED TRANSACTION LOG
NO
449
EOF ?
NO
YES
END

FIG. 11

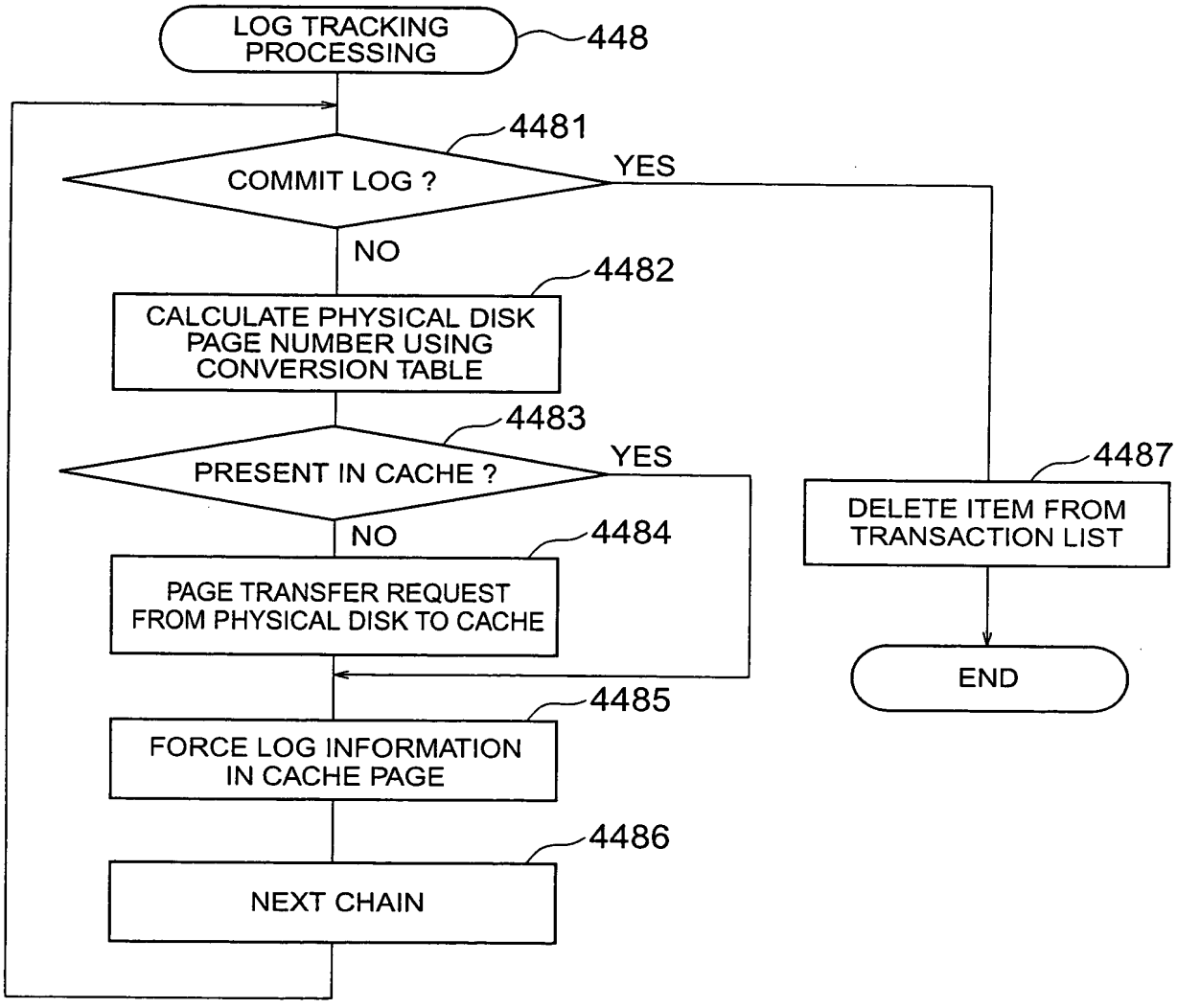

LOG TRACKING PROCESSING
448
4481
COMMIT LOG ?
YES
NO
4482
CALCULATE PHYSICAL DISK PAGE NUMBER USING CONVERSION TABLE
4483
PRESENT IN CACHE ?
YES
NO
4484
PAGE TRANSFER REQUEST FROM PHYSICAL DISK TO CACHE
4485
FORCE LOG INFORMATION IN CACHE PAGE
4486
NEXT CHAIN
4487
DELETE ITEM FROM TRANSACTION LIST
END

FIG. 12

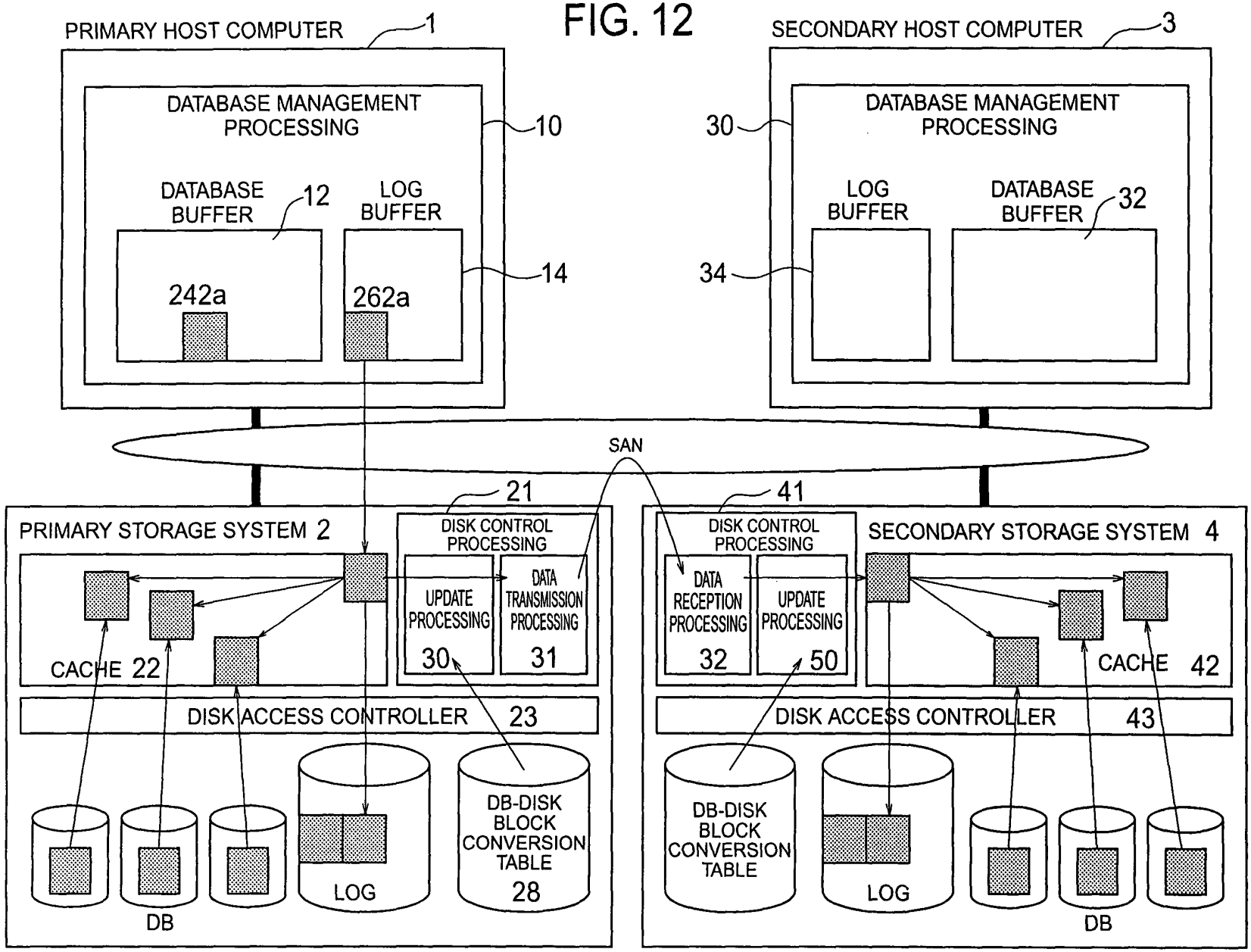

PRIMARY HOST COMPUTER
1
DATABASE MANAGEMENT PROCESSING
10
DATABASE BUFFER
12
LOG BUFFER
14
242a
262a
SECONDARY HOST COMPUTER
3
30
DATABASE MANAGEMENT PROCESSING
LOG BUFFER
DATABASE BUFFER
32
34
SAN
21
41
PRIMARY STORAGE SYSTEM 2
DISK CONTROL PROCESSING
UPDATE PROCESSING
30
DATA TRANSMISSION PROCESSING
31
CACHE 22
DISK ACCESS CONTROLLER 23
DB-DISK BLOCK CONVERSION TABLE
28
LOG
DB
DISK CONTROL PROCESSING
DATA RECEPTION PROCESSING
32
UPDATE PROCESSING
50
SECONDARY STORAGE SYSTEM 4
CACHE 42
DISK ACCESS CONTROLLER 43
DB-DISK BLOCK CONVERSION TABLE
LOG
DB

FIG. 13

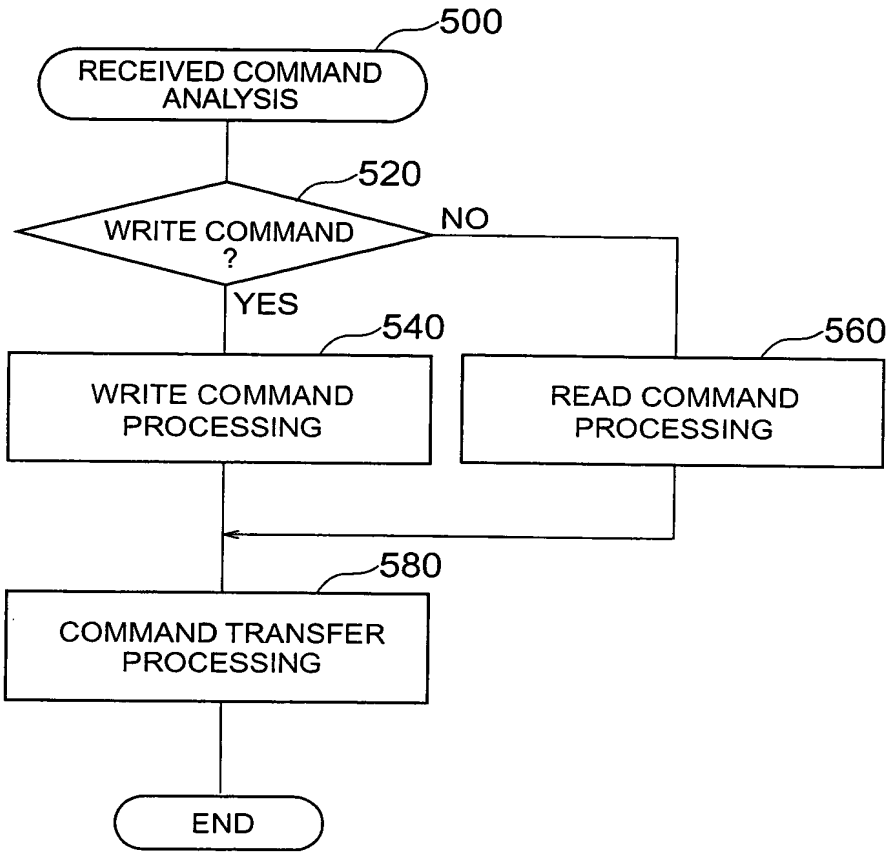

500
RECEIVED COMMAND ANALYSIS
520
WRITE COMMAND ?
NO
YES
540
WRITE COMMAND PROCESSING
560
READ COMMAND PROCESSING
580
COMMAND TRANSFER PROCESSING
END

FIG. 14

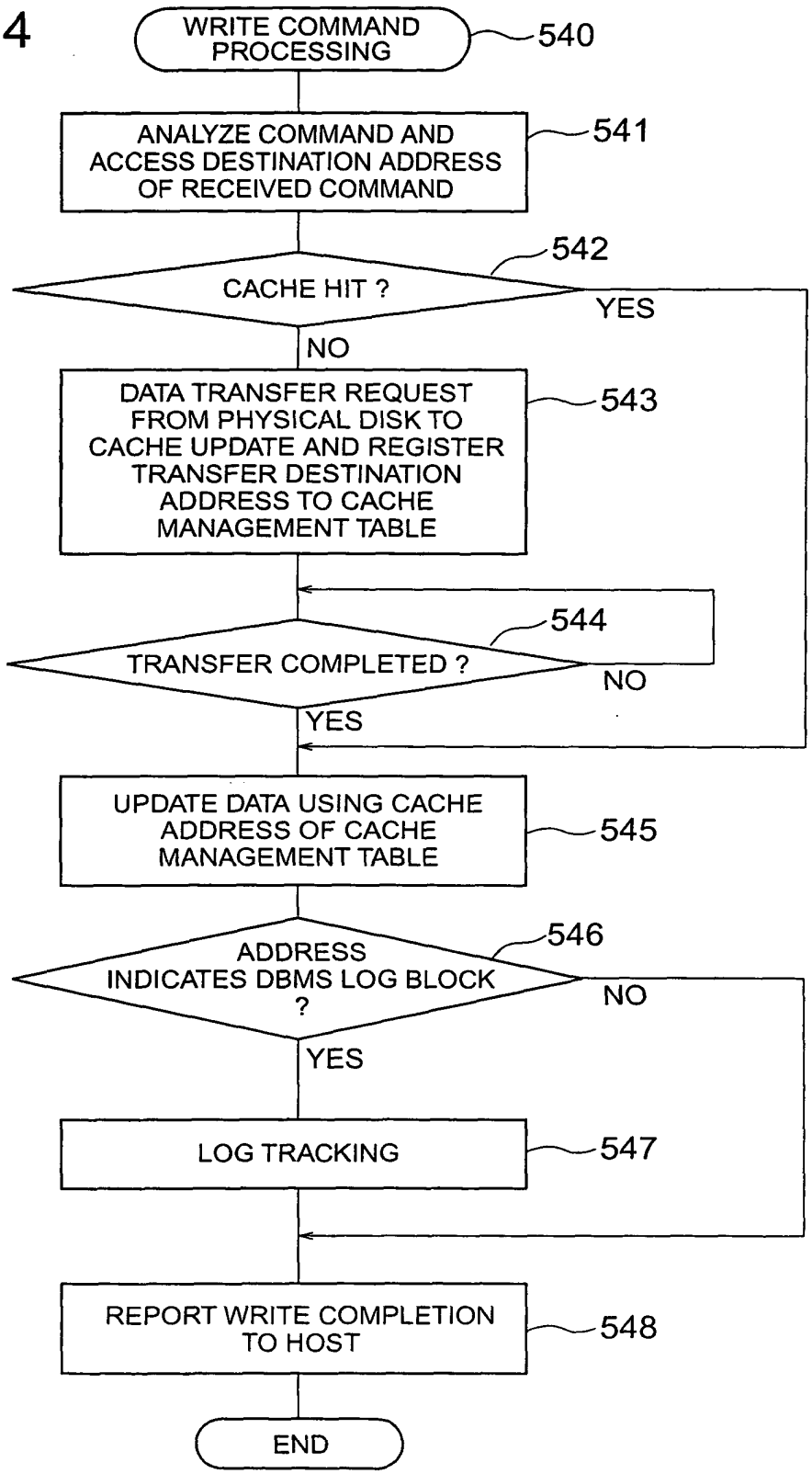

WRITE COMMAND PROCESSING
540
ANALYZE COMMAND AND ACCESS DESTINATION ADDRESS OF RECEIVED COMMAND
541
CACHE HIT ?
542
YES
NO
DATA TRANSFER REQUEST FROM PHYSICAL DISK TO CACHE UPDATE AND REGISTER TRANSFER DESTINATION ADDRESS TO CACHE MANAGEMENT TABLE
543
TRANSFER COMPLETED ?
544
NO
YES
UPDATE DATA USING CACHE ADDRESS OF CACHE MANAGEMENT TABLE
545
ADDRESS INDICATES DBMS LOG BLOCK ?
546
NO
YES
LOG TRACKING
547
REPORT WRITE COMPLETION TO HOST
548
END

FIG. 15

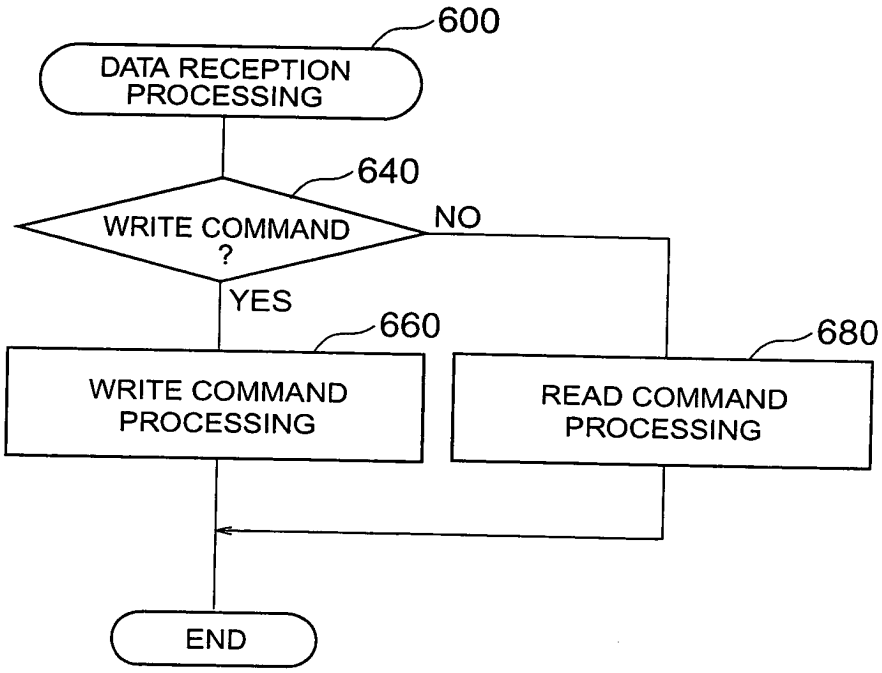
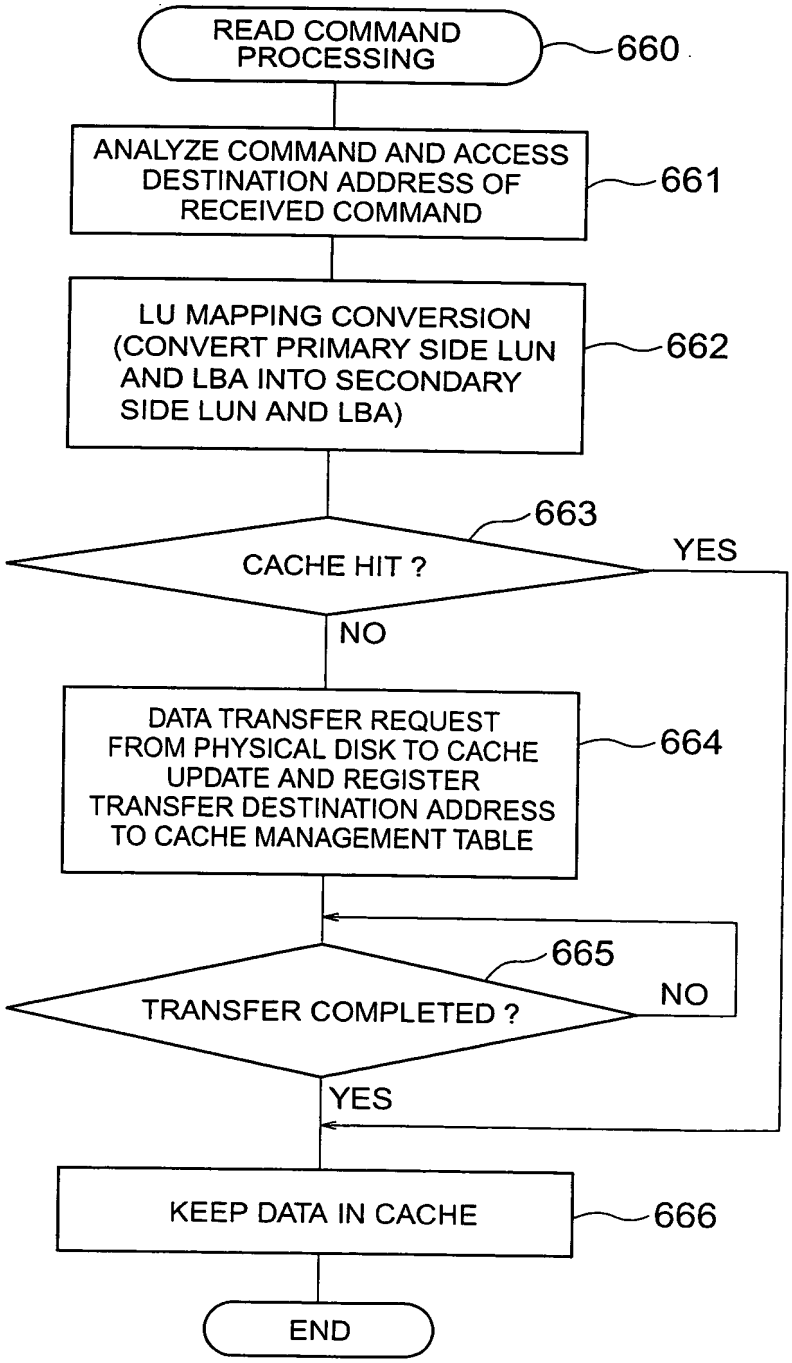

600
DATA RECEPTION PROCESSING
640
WRITE COMMAND ?
NO
YES
660
WRITE COMMAND PROCESSING
680
READ COMMAND PROCESSING
END

FIG. 16


READ COMMAND PROCESSING
660
ANALYZE COMMAND AND ACCESS DESTINATION ADDRESS OF RECEIVED COMMAND
661
LU MAPPING CONVERSION (CONVERT PRIMARY SIDE LUN AND LBA INTO SECONDARY SIDE LUN AND LBA)
662
663
CACHE HIT ?
YES
NO
DATA TRANSFER REQUEST FROM PHYSICAL DISK TO CACHE UPDATE AND REGISTER TRANSFER DESTINATION ADDRESS TO CACHE MANAGEMENT TABLE
664
665
TRANSFER COMPLETED ?
NO
YES
KEEP DATA IN CACHE
666
END